

THE STATUS OF *UROPHORA ACUTICORNIS* AND *U. SABROSKYI* (DIPTERA: TEPHRITIDAE)¹

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ABSTRACT: *Urophora acuticornis* is transferred to *Rhagoletis* (Trypetinae). Its relationships to other species of *Rhagoletis* and other related genera, here placed in the new subtribe Carpomyina, are discussed. Hypothesized synapomorphies for the Carpomyina and for the tribe Myopitini (Tephritinae) are also discussed. *Urophora sabroskyi* is considered a junior synonym of *Aciurina bigeloviae*.

Steyskal (1979) provided a much needed review of the genus *Urophora* Robineau-Desvoidy (Tephritinae, Myopitini), including keys to the New and Old World species and descriptions of 20 new species. While reviewing a draft of the forthcoming Handbook of the Tephritidae of America north of Mexico (R.H. Foote & F.L. Blanc, in prep.), I discovered that two of these species, *acuticornis* Steyskal and *sabroskyi* Steyskal, are not true *Urophora* or even members of the tribe Myopitini. *Urophora acuticornis* belongs to *Rhagoletis* Loew (Trypetinae), whereas *sabroskyi* is a synonym of *Aciurina bigeloviae* (Cockerell). To make these changes available for the Foote & Blanc handbook, the relationships and proposed reclassification of these species are discussed. Synapomorphies for the Myopitini and the new subtribe Carpomyina (Trypetinae, Trypetini) are also analyzed.

MATERIALS AND METHODS

Specimens were examined from the following collections: California Academy of Sciences (CAS); National Museum of Natural History, Smithsonian Institution (USNM); and University of Arizona (UAT). The morphological terminology follows McAlpine (1981), except as noted in Norrbom & Kim (1988), and for the wing pattern, Foote (1981).

Rhagoletis acuticornis (Steyskal), *n. comb.*

Urophora acuticornis Steyskal 1979: 43 (holotype ♂ (USNM), Texas: El Paso).

In addition to the holotype, I examined the following specimens of *acuticornis*: 1 ♂ 1 ♀ (USNM), New Mexico, Dona Ana Co., Las Cruces, 22.V.1985, C.A. Sutherland; 1 ♂ (CAS), New Mexico, Sierra Co., Percha

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Dam State Park, 16.V.1986, W.J. Pulawski; and 1 ♂ (UAT), Arizona, Phoenix, Cotton Research Center, 11-14.V.1979, G. Butler. I have not examined the allotype ♀ from California.

A brief redescription based on these specimens is given here because a number of important characters were not included in the original description.

Length 2.9-3.5 mm; all setae dark brown to black, slender. Head: yellow, except most of occiput and postgena blackish; face with strong carina; 3-4 pairs of frontal setae; 2 pairs of orbital setae, posterior pair inclinate; first flagellomere of antenna with distinct dorsoapical point. Thorax: dark brown to black except most of scutellum medially and dorsal anepisternal stripe yellow; postpronotal lobe and all of scutum dark; scutum microtrichose except for anterior 1/4 and posterior 1/3, microtrichose area sometimes divided by narrow bare stripes; dorsocentral setae about even with supra-alar setae; lateral pair of scapular setae well developed, medial pair small. Legs: yellow except hind coxa and base of hind femur usually brown. Wing (Fig. 5): pattern dark brown, reduced, with narrow discal and subapical bands, interrupted subbasal band, and small spot at apex of R_{2+3} and broad spot at apex of R_{4+5} that apparently represent the anterior apical band; accessory costal and posterior apical bands absent; subapical band meeting costa well basal to apex of R_{2+3} ; Cu_2 straight or slightly concave. Abdomen: tergites entirely dark, without bands; pleura transparent, membranous; male with epandrium (Fig. 2) short along longitudinal axis; anterior lobe of interparameral sclerite (sternite 10) well developed; outer surstylus about 2 times as long as inner surstylus, with small mesal lobe (Fig. 3) just beyond apex of inner surstylus; distiphallus (Fig. 4) with small, simple, non-setose apical lobe; female with 3 spherical spermathecae; sytergosternite 7 with large medioapical unsclerotized area ventrally, a smaller one dorsally; aculeus about 0.91 mm long, apex elongate, slender, simple.

Urophora acuticornis does not belong in the tribe Myopitini, which is defined by three synapomorphies: 1) the posterior pair of orbital setae absent; 2) vein Cu_2 convex (White & Clement 1987); and 3) the abdominal pleura opaque, darker than the sternites (at least in all species of *Myopites* Blot, *Rhynencina* Johnson, and New and Old World *Urophora* that I have examined). The plesiomorphic states of these characters are present in *acuticornis*: both pairs of orbital setae are present, vein Cu_2 is straight to slightly concave, and the abdominal pleura are light yellow and translucent. The female of *acuticornis* also has three spermathecae, the plesiomorphic state in the Tephritidae. All Myopitini and other Tephritinae have only two (Hancock 1986). Finally, the holotype of *acuticornis* was reared from a fruit of *Lycium berlandieri* Dunal (Solanaceae), whereas the Myopitini breed in flower heads or stem galls of Asteraceae.

As in the tribe Terelliini (Tephritinae), *acuticornis* has convergent posterior orbital setae, a derived character state within the Tephritidae.

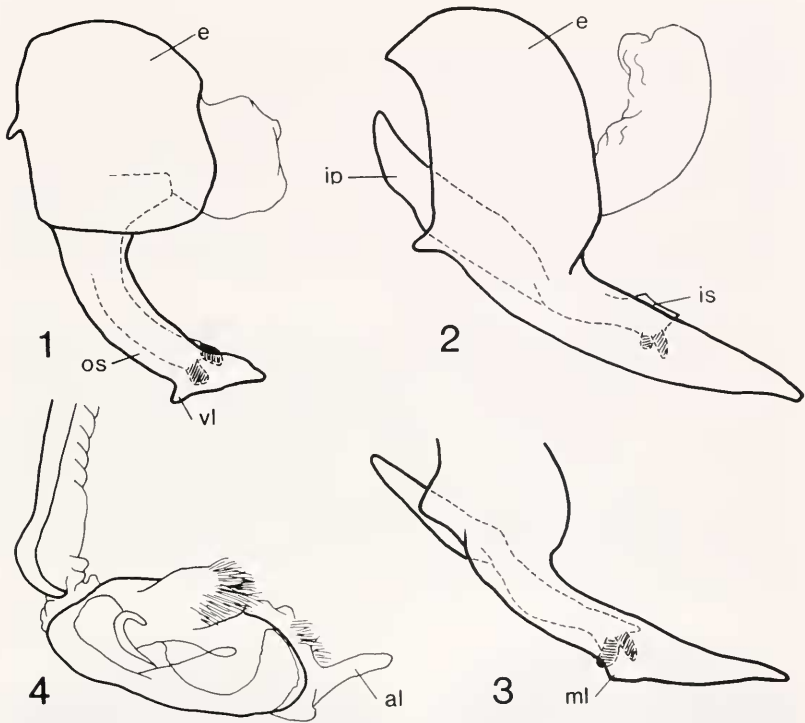


Figure 1, *Aciurina bigeloviae* (holotype of *U. sabroskyi*), epandrium and surstyli, lateral view. Figure 2, *Rhagoletis acuticornis*, Las Cruces, N. M., epandrium and surstyli, lateral view. Figure 3, same, ventrolateral view. Figure 4, same, distiphallus. al - apical lobe of distiphallus, ip - interparameral sclerite, is - inner surstylus, ml - mesal lobe of outer surstylus, os - outer surstylus, vl - ventral lobe of outer surstylus.



Figure 5, *Rhagoletis acuticornis*, Las Cruces, N.M., wing.

In the Foote & Steyskal (1987) key to the Nearctic genera of Tephritidae, it runs with difficulty to *Orellia* Robineau-Desvoidy. This similarity with the Terelliini is due to homoplasy, however. Other apomorphies of the Terelliini (e.g. lyre-shaped scutal pattern, two spermathecae) are not present, and other derived characters indicate that *acuticornis* belongs to the Carpomyina, new subtribe (Trypetinae, Trypetini). This subtribe includes at least the following genera: *Carpomya* Costa, *Myiopardalis* Bezzi, *Goniglossum* Rondani, *Rhagoletis* Loew, *Zonosemata* Benjamin, *Stoneola* Hering, *Haywardina* Aczél, *Cryptoplagia* Aczél, *Rhagoletotrypeta* Aczél, *Cryptodacus* Hendel, and *Lezca* Foote.

The Carpomyina is defined by a single synapomorphy, although at least one other character may be a synapomorphy with some homoplasy due to secondary modification. In all Carpomyina, including *acuticornis*, the apex of syntergosternite 7 of the female has a weakly sclerotized apicomedial area ventrally and usually dorsally, a clearly apomorphic character that I have not observed in any other Tephritidae. In dried specimens this unsclerotized area is visible only as a pair of weak folds (e.g. see Stoffolano & Yin 1987, Fig. 7), but it is distinct in cleared preparations of the terminalia (Fig. 6).

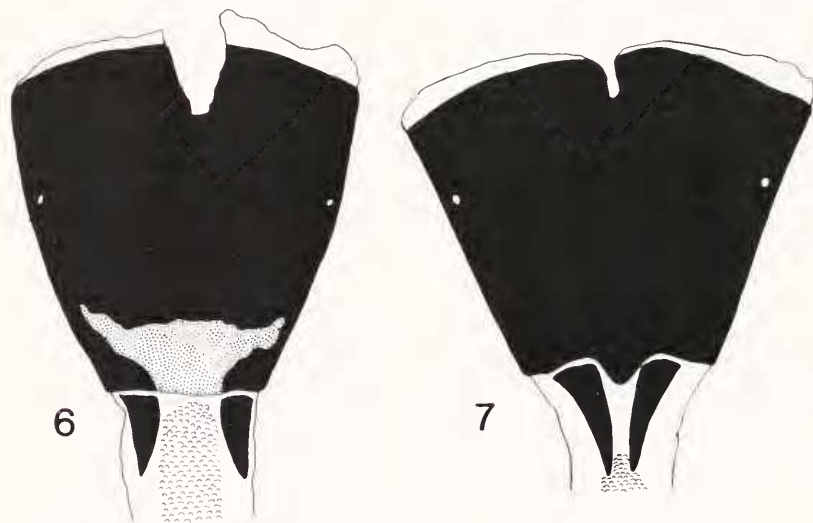


Figure 6, *Rhagoletis pomonella* (Walsh), New Haven, Conn., female syntergosternite 7, ventral view. Figure 7, same, *Oedicarena latifrons* (Loew), Lagunas de Zempoala, Mexico.

Another possible synapomorphy for the Carpomyina is the type of male terminalia found in most species, with the outer surstylus elongate, with a mesal lobe just posterior to the apex of the inner surstylus. The outer surstylus lacks the mesal lobe in some species of *Rhagoletotrypeta* and it is short and without the lobe in *Zonosemata*, but this may be secondary modification from the shape in the other genera. Species of *Paraterellia* Foote, which may be related to the Carpomyina, also have elongate surstyli with a mesal lobe; this similarity may be the result of homoplasy or the shape of the surstylus may be a synapomorphy for a larger taxon including the Carpomyina and *Paraterellia* (Norrbon *et al.*, 1988).

Another character of possible phylogenetic significance is the accessory costal wing band, which is present in *Oedicarena* Foote and about half of the species of Carpomyina, but is rare in other Tephritidae. It may be a synapomorphy for a larger taxon including *Oedicarena* and the Carpomyina, with considerable secondary loss. Berlocher & Bush (1982) suggested a close relationship between *Zonosemata*, some species of *Rhagoletis*, and *Oedicarena* based on electrophoretic data, but unless there has been considerable homoplasy in genitalic characters, *Oedicarena* and *Paraterellia* are at most the sister group of the Carpomyina (Norrbon *et al.*, 1988). Both *Paraterellia* and *Oedicarena* have the apex of female syntergosternite 7 normally sclerotized (Fig. 7) and differ from the Carpomyina in a number of characters of the male terminalia.

Within the Carpomyina I am uncertain of the relationship of *acuticornis* to the other taxa. The antennal first flagellomere in *acuticornis* has a dorsoapical point, an apomorphic character found in *Carpomya*, *Myiopardalis*, *Cryptoplagia*, *Haywardina*, *Zonosemata*, and most *Rhagoletis*, but the significance of this character is unclear. It is intraspecifically variable in some species of *Rhagoletis* and was probably lost in *Goniglossum*, which appears closely related to *Myiopardalis*. I have discovered no other obvious synapomorphies for *acuticornis* and any other taxa of Carpomyina; *acuticornis* lacks derived characters such as the crease or spur vein in cell r_1 in *Carpomya*, *Myiopardalis*, and *Goniglossum*, r-m located near dm-cu in *Haywardina*, the distinctively shaped distiphallus and spermathecae of *Zonosemata*, the serrate aculeus of *Cryptodacus* and *Lezca*, and the white or yellow medial sctual stripe found in *Cryptodacus*, *Lezca*, *Rhagoletotrypeta*, *Cryptoplagia*, *Haywardina*, and *Zonosemata*. *Paraterellia* have convergent posterior orbital setae like *acuticornis*, but the relationship of that genus to the Carpomyina is unclear, and a close relationship between it and *acuticornis* is doubtful. Except for the convergent posterior orbitals, *acuticornis* fits the diagnosis of Bush (1966) for

Rhagoletis; however, all of the characters in that diagnosis are probably plesiomorphic for the Carpomyina, and *Rhagoletis* as currently composed is probably paraphyletic (Bush 1966, Berlocher & Bush 1982). Although the species of *Rhagoletis*, especially those from the Nearctic Region, have been well studied and segregated into a number of species groups (Bush 1966, Berlocher & Bush 1982, and Foote 1981), the monophyly of the genus has not been demonstrated and its relationships to other Carpomyina are poorly understood.

None of the currently recognized species groups of *Rhagoletis* will easily accommodate *acuticornis*. The *psalida* group (Foote 1981), in which the postpronotal lobe is entirely black and the anterior and posterior apical wingbands are often incomplete, might be related. One species of the group, *metallica* (Schiner), also has the abdominal tergites entirely black like *acuticornis*. However, *acuticornis* lacks other derived characters of the *psalida* group, such as the scutellum entirely black, the scutum without microtrichia, and the subapical band ending anteriorly near the apex of vein R_{2+3} . In addition, the spermathecae, which are rodlike in the *psalida* group, are spherical in *acuticornis*, and both the accessory costal and posterior apical bands, which are at least partially present in the *psalida* group, are absent. At least one of those two bands is also present in the *nova*, *striatella*, and *ferruginea* groups (Foote 1981), those that also breed in Solanaceae like *acuticornis* and the *psalida* group. The reduced wing pattern of *acuticornis* is unlike any other *Rhagoletis* species; in those in which the accessory costal and posterior apical bands are absent, the other wing bands are broad and well developed. The apical lobe of the distiphallus is simple in *acuticornis*, not distinctively shaped as in some *Rhagoletis* species groups (see Bush 1966).

Despite its uncertain relationship to the other species of *Rhagoletis*, the transfer of *acuticornis* to that genus is the most reasonable classification at its time. The establishment of a new genus for *acuticornis* would be premature without a better understanding of the relationships among the species groups of *Rhagoletis* and the other genera of Carpomyina.

Aciurina bigeloviae (Cockerell)

Aciurina bigeloviae (Cockerell); Steyskal 1984: 592.

Urophora sabroskyi Steyskal 1979: 55 (Holotype ♂ (USNM), Washington: Garfield Co., Wawawai), n. syn.

The holotype of *U. sabroskyi* has one of the diagnostic characters of the Myopitini, the posterior pair of orbital setae are absent. This specimen is not a myopitine, however, and lacks the other synapomorphies of the tribe. Although the basal cubital cell does not have a strong posteroapi-

cal extension. Cu_2 is straight and meets vein A_1 at an acute angle (see Steyskal 1979, fig. 14); Cu_2 is not convex as in the myopitini. The abdominal pleura are light yellow and translucent, not darker than the sclerites as in the Myopitini.

The absence of the pair of posterior orbital setae is not common in *Aciurina* Curran, but Steyskal (1984), in his diagnosis for the genus, states that they are reclinate or absent, and the *sabroskyi* type runs to this genus in the key of Foote & Steyskal (1987). It also has male terminalia typical of *Aciurina* and the genera *Valentibulla* Foote & Blanc and *Eurosta* Loew; the epandrium is elongate along the longitudinal axis, the surstyli are elongate, posteriorly curved, arising from the anterior end of the epandrium, and the outer surstylus has a small mesally curved subapical ventral lobe (Fig. 1). The postocular setae and the scutal setulae, which are usually black and are always slender in the Myopitini, are all white and slightly swollen. There are 4-5 pairs of frontal setae, not the usual 2 in the Myopitini.

The holotype of *sabroskyi* runs to *bigeloviae* (Cockerell) in Steyskal's (1984) key to the species of *Aciurina*, and *sabroskyi* is here considered a junior synonym of that species. Steyskal's concept of *bigeloviae* probably represents a species complex (Dodson & George 1986; J. Jenkins, pers. comm.), however, because it includes populations that form several types of galls and, compared with other species of *Aciurina*, a large amount of variation in wing pattern. When this complex is resolved, *sabroskyi* will likely be recognized as a synonym of one of the other species that Steyskal (1984) synonymized under *bigeloviae*. The wing pattern of the *sabroskyi* type (see Steyskal 1979, Fig. 14) is unlike typical *bigeloviae*; it is highly reduced and similar to that of the type of *semilucida* Bates (see Steyskal 1984, Fig. 16). It also resembles that of *notata* (Coquillett) in that there is no dark spot in cell c, but cell sc is elongate as in *bigeloviae*.

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